HEARING PROTECTION

Hearing Protection

Must be worn...

- When the danger of a noise hazard is present
- By employees & visitors
- When hazard/danger signs indicate a hazard
- When noise levels exceed 84 dBA & 140 dBP
- Double protection is required at 104 dBA

HPD Selection Considerations

- Only approved protection is acceptable
- Selection should be based on
  - Advantages/disad
  - Work environment
  - Attenuation
  - NRR

Noise Reduction Rating-NRR

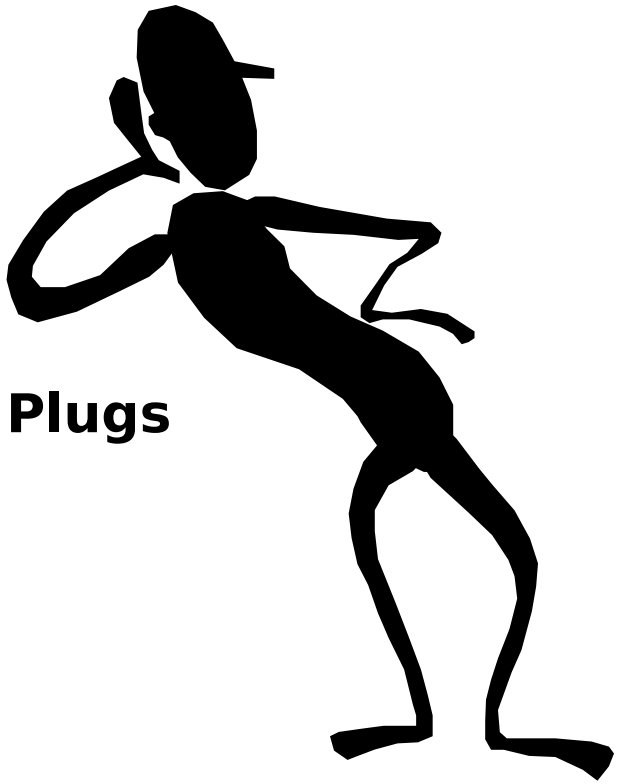
- All HPD’s have an NRR advertised on the packaging.
- It indicates attenuation level of the HPD.
- The advertised NRR does not accurately reflect real world attenuation.
- Field testing suggests that actual NRR is half the advertised value.

Selection Considerations, cont.

- Consider double protection needs. The 2nd form of HPD provides 5-6 dB of additional attenuation. It does not double the protection capability
- Administrative controls are required when HPD's cannot reduce the noise exposure below 84 dBA.

Approved Types of HPD's:

- **Earplugs**
  - **Pre-formed**
    - **Single Flange**
    - **Triple Flange**
    - **Quad Flange**
    - **Combat Arms Ear Plugs**
  - **Hand-formed**
- **Noise Muffs**
- **Ear Canal Caps**
- **Helmets**



Earplugs

- An ear gauge can be used to help determine the appropriate size earplug.
- The earplugs themselves must be then be fitted & checked to ensure correct size.
- The earplug carrying case can be used to assist with the fitting process. Case is available in olive drab or Navy blue color.

Pre-Formed (Vinyl) Earplugs

- Single Flange (No longer manufactured):
  - Noise Reduction Rating (NRR)=23d
  - 5 color-coded sizes:
    - White (Extra Small)= 10% of po
    - Green (Small)= 25%
    - Orange (Medium)=30%
    - Blue (Large)= 40%
    - Red (Extra Large)= 25%

FITTING TECHNIQUE:

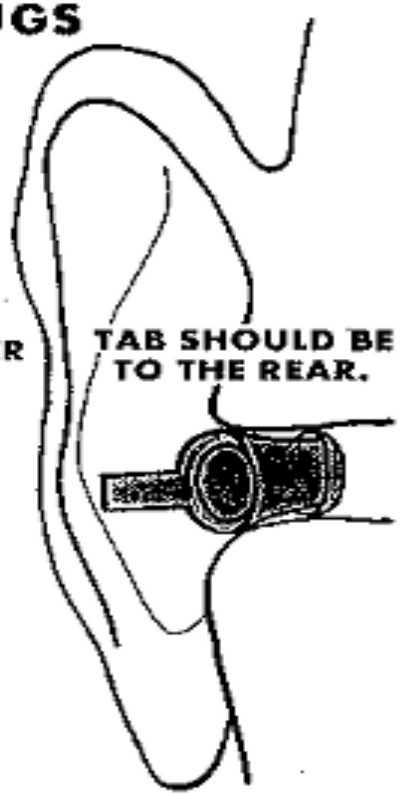
FOR MAXIMUM PROTECTION AND COMFORT, INSERT SINGLE FLANGE EARPLUGS AS FOLLOWS:

1. MAKE THE EAR CANAL ACCESSIBLE BY REACHING OVER HEAD WITH OPPOSITE HAND AND PULLING EAR OUTWARD.

2. GRASP PLUG TAB BETWEEN THUMB AND FOREFINGER AND INSERT PLUG INTO EAR CANAL.

3. PUSH AND TWIST PLUG TOWARD REAR-CENTER OF HEAD UNTIL SEAL IS MADE.

4. IF A GOOD SEAL IS NOT OBTAINED, USE SMALLER OR LARGER SIZE. SINGLE FLANGE PLUGS ARE AVAILABLE IN FIVE SIZES- EX. SMALL , SMALL, MEDIUM, LARGE, AND EX. LARGE.



DA Poster 40-501C, Apr 1991 DISTRIBUTION: To be distributed in accordance with DA Form 12-44, block 0556, requirements for DA Poster 40-501C.

Pre-Formed Earplugs (cont.):

- Triple Flange:
  - NRR= 26dB
  - 3 color coded sizes:
    - Green (Small)= 10% of the population
    - Orange (Medium)=80%
    - Blue (Large)= 30%

FITTING TECHNIQUE:

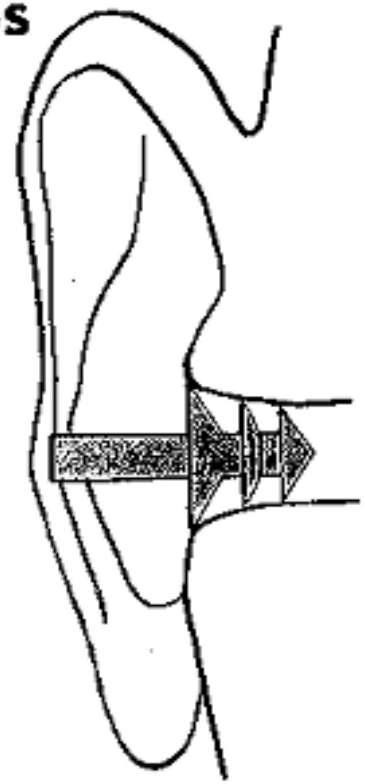
FOR MAXIMUM PROTECTION AND COMFORT INSERT TRIPLE FLANGE EARPLUGS AS FOLLOWS :

1. MAKE THE EAR CANAL ACCESSIBLE BY REACHING OVER HEAD WITH OPPOSITE HAND AND PULLING EAR OUTWARD.

2. GRASP PLUG FIRMLY BEHIND LARGEST FLANGE.

3. INSERT SMALLER FLANGE IN EAR CANAL. PUSH AND TWIST TOWARD REAR-CENTER OF HEAD.

4. IF A GOOD SEAL IS NOT OBTAINED, USE SMALLER OR LARGER SIZE. TRIPLE FLANGE PLUGS ARE AVAILABLE IN THREE SIZES- LARGE, REGULAR, AND SMALL.



DA Poster 40-5010, Apr 1991 DISTRIBUTION: To be distributed in accordance with DA Form 12-04, block 0856, requirements for DA Poster 40-5010.

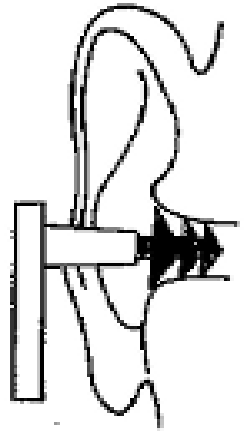
FITTING TECHNIQUE (cont.)

EARPLUG SEATING DEVICE AND CARRYING CASE

TRIPLE-FLANGE EARPLUGS (INSERTION INSTRUCTIONS):

A. INSERT STEM OF PLUG IN OPEN END OF CASE LID.

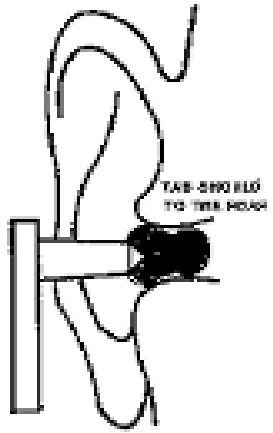
B. PUSH AND WIGGLE PLUG TOWARD REAR-CENTER OF HEAD



SINGLE-FLANGE EARPLUGS (INSERTION INSTRUCTIONS):

A. GRASP PLUG TAB BETWEEN THUMB AND FOREFINGER AND INSERT INTO EAR CANAL.

B. USE POINTED END OF CASE LID TO IMPROVE SNUG FIT.

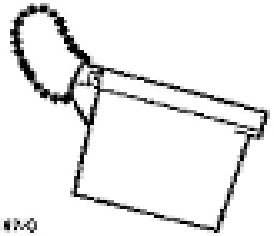


GENERAL INSTRUCTIONS:

A. WHEN NOT IN USE, KEEP PLUGS IN CARRYING CASE.

B. ENSURE THAT PLUGS ARE CLEANED WITH SOAP AND WATER AND ARE DRY WHEN RETURNED TO THE CASE.

C. WEAR YOUR EARPLUG CARRYING CASE (WITH EARPLUGS) AS PART OF YOUR WORK UNIFORM. THEY ARE PART OF YOUR PERSONAL ISSUE AND ARE TO BE RETAINED UPON CHANGE OF STATION.



(CASE AND EARPLUG INSERTER, PLASTIC, NO REFLECTIVE, 2BB, NSN 6515-01-100-1870)

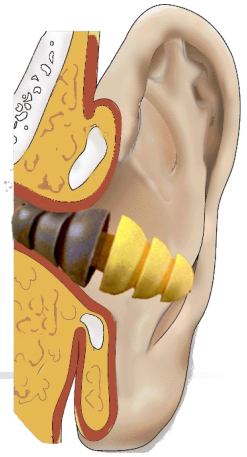
Pre-Formed Earplugs (cont.):

Quad Flange:

- **NRR= 25dB**
- **Universal Fit/one size**
- **Ultra-soft polymer provides a comfortable and effective seal**
- **Fitting technique – same as triple flange plug**

The Combat Arms Earplug

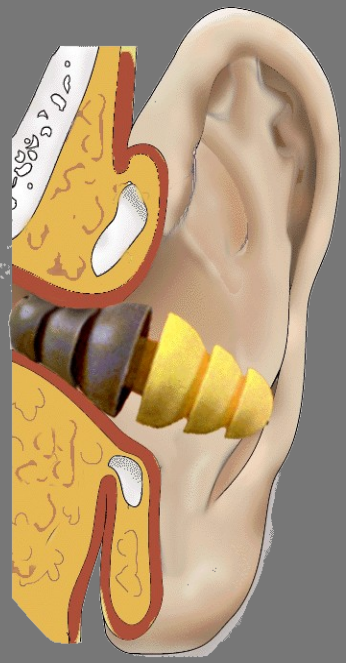
NRR = 25 (olive side)



- A 2-sided color-coded plug developed by Army to protect soldiers in operational listening conditions.
- Yellow single-sided version also available.
- Yellow side has a baffle that allows steady-state sounds to enter, but quiets impulse/impact noise.
  - Baffled side in/OD green side out = combat/patrol
  - Solid plug in/ yellow side out = full protection, garrison & training use
- Baffled side does not markedly reduce ability to hear speech and other non-impact sounds.
- Fitting technique – same as triple flange plug.

COMBAT ARMS EARPLUG

- Insert YELLOW plugs for weapons fire in dismounted mode.
- Insert OLIVE DRAB plugs for steady state noise in and around aircraft, noisy vehicles and watercraft, etc.



- Keep filter holes free of earwax and other debris.
- Check proper insertion for slight tension by gently tugging on plugs.
- Ensure that plugs are cleaned with soap and water and dry when returned to case.

NSN 6515-01-466-2710

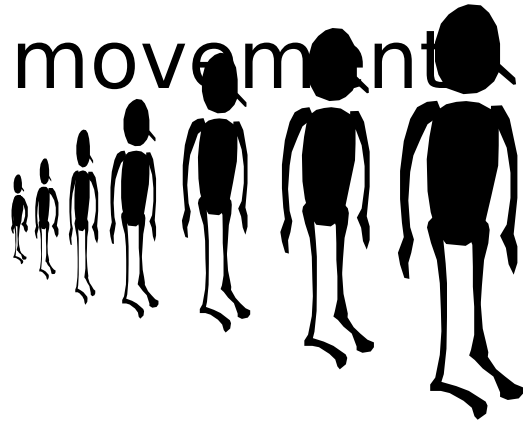
USACHPPM
Readiness thru Health
U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

Advantages Of Pre-Formed Earplugs:

- Inexpensive
- Can be washed and re-used (durable)
- Easily carried on uniform or clothing in earplug carrying case
- Effective and fairly comfortable if properly fitted/insert

Disadvantages Of Pre-Formed Earplugs:

- Requires individual medical fitting of both ears (never assume same size, particularly with single flange)
- Frequent insertion may cause irritation
- Works loose with jaw movement
- Improper fit reduces effectiveness



Hand Formed Foam Earplugs

- **New Dynamics (“Sound Guard”) currently the only approved vendor of medium foam plug.**
- **NRR=19-28dB, depending on fit characteristics.**
- **Can also order (GSA contract) small and large sized foam plugs. Aearo SuperFit 30 is small size, and SuperFit 33 is large size.**
- **These plugs have a colored center band to check fit. Only one color should be visible when properly fitted.**

NEW DYNAMICS
CORP.

Fitting Technique For Hand Formed Earplugs:

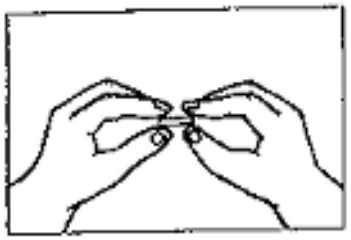
- Roll earplug between thumb and index finger to the smallest size possible.
- With opposite hand, pull up and back on pinna.
- Insert earplug so that at least 2/3 of the plug is in the ear canal.
- Use index finger to hold earplug in place while it expands.
- Ensure there are no creases in the plug.
- If difficult to insert, try larger or smaller size.

Fitting Technique (cont):

FOAM EARPLUGS

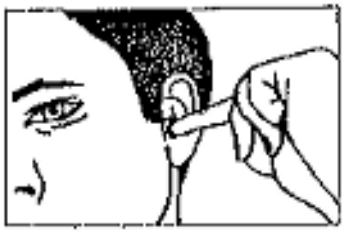
FOR MAXIMUM EFFECTIVENESS AND COMFORT INSERT FOAM EARPLUGS (NSN 6515-00-137-6345) AS FOLLOWS: IMPORTANT – HANDS AND PLUGS SHOULD BE CLEAN PRIOR TO USE. DO NOT USE WHERE HAZARDOUS CHEMICALS OR MATERIALS COULD BE TRANSFERRED TO PLUG.

1 WITH BOTH HANDS GRASP THE ROUND SIDE OF THE PLUG. SLOWLY ROLL AND COMPRESS THE PLUG INTO A VERY THIN, CREASE-FREE CYLINDER.

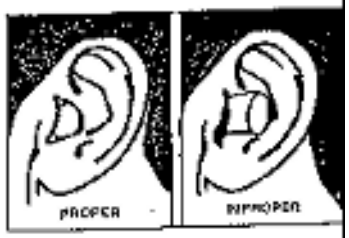


2 WHILE COMPRESSED, INSERT THE PLUG WELL INTO THE EAR CANAL. FITTING THE PLUG IS EASIER IF THE OUTER EAR IS PULLED OUTWARD AND UPWARD DURING INSERTION.

3 WITH FINGERTIP, GENTLY HOLD THE PLUG IN PLACE UNTIL IT WORKS TO EXPAND AND BLOCK THE NOISE. QUALITY OF FIT MAY BE ESTIMATED BY OCCLUSION.



4 EARPLUG FIT CAN BE TESTED IN THE PRESENCE OF NOISE BY ALTERNATELY COVERING AND UNCOVERING THE EARS WITH TIGHTLY PRESSED HANDS. WITH PROPERLY FITTED PLUGS THE NOISE LEVELS SHOULD SEEM NEARLY THE SAME WHETHER OR NOT THE EARS ARE COVERED. KEEP PLUGS CLEAN BY WASHING IN MILD SOAP AND RINSING THOROUGHLY IN WATER. DISCARD IF DISCOLORATION OR DISTORTION OCCURS AFTER CLEANING.



DA Poster 40-501B, Apr 1991 DISTRIBUTION: To be distributed in accordance with DA Form 12-09, block 0656, requirements for DA Poster 40-501B.

Advantages Of Hand Formed Earplugs:

- Most comfortable
- Universal fit
- Medical fitting not required
- Least expensive HPD’s for infrequent or intermittent exposure

Disadvantages Of Hand Formed Earplugs:

- Must be properly molded and inserted
- Easily soiled, v
- One-time use

Characteristics Of A Good Earplug Fitting:

- Voices sound muffled
- Vacuum effect
- Comfortable
- Single flange tab oriented to rear of head
- Largest flange of triple flange is flush against ear canal opening
- Fit each ear individually
- Only 1/3 or less of the plug is visible

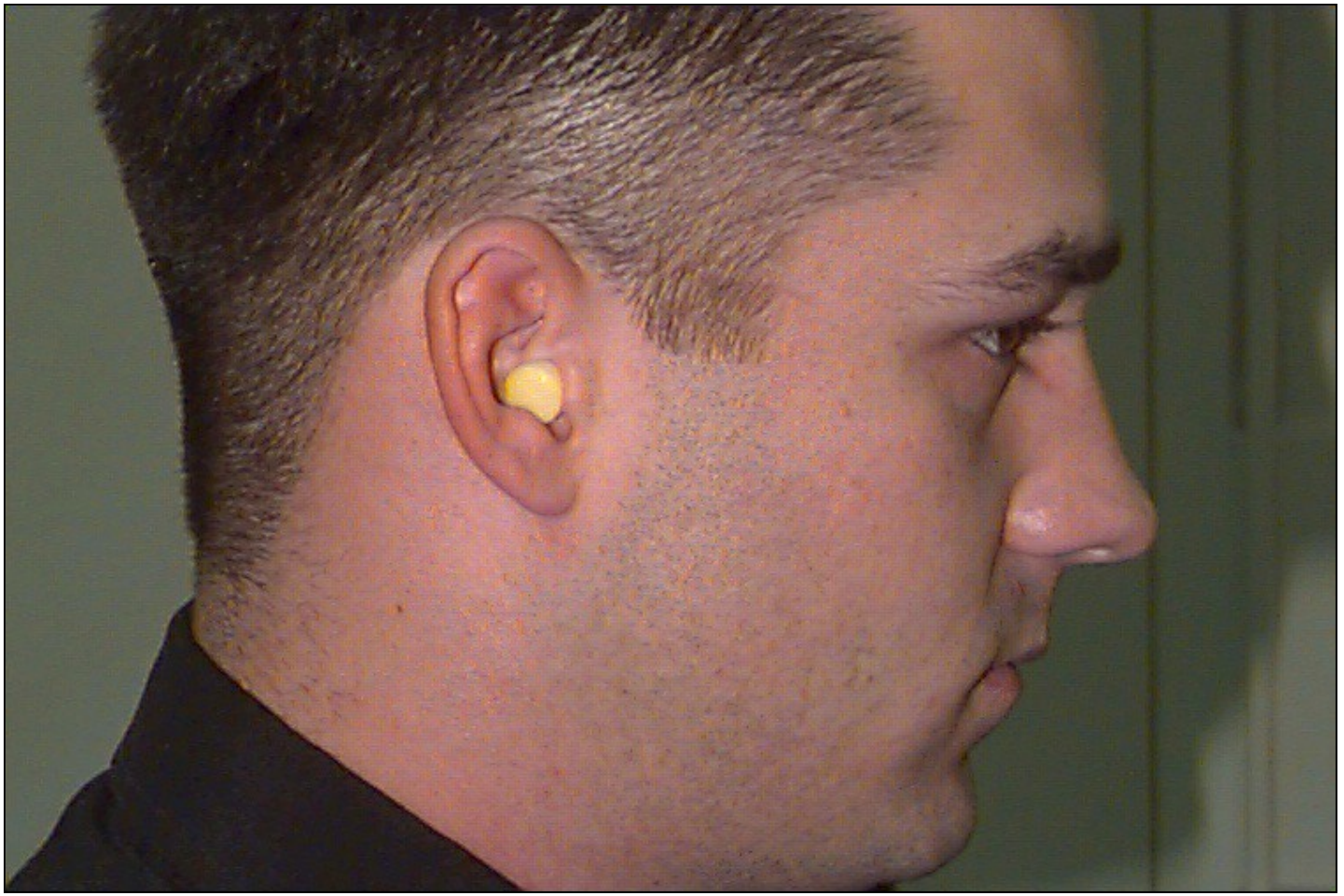
GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

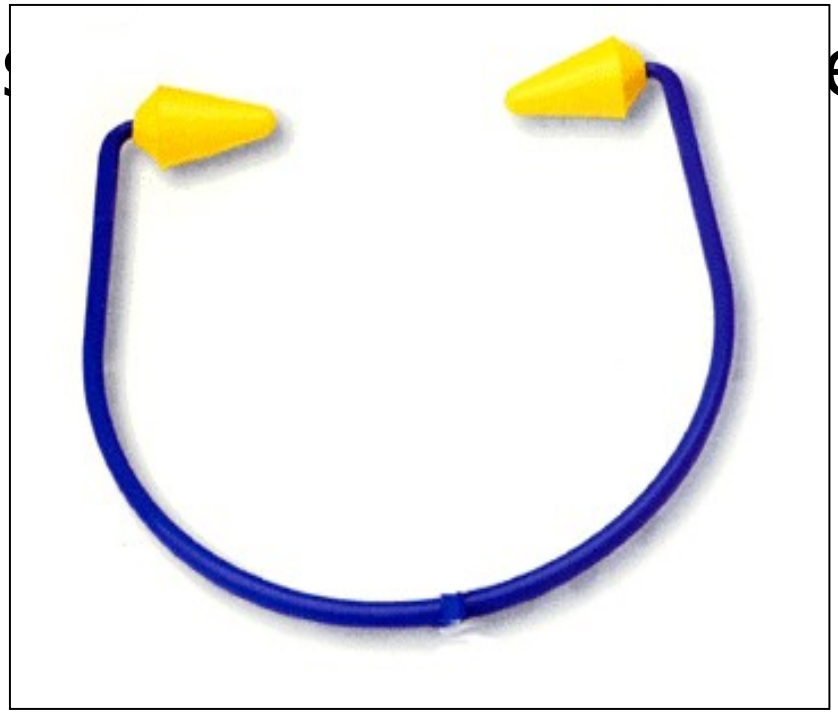
GOOD FIT/BAD FIT?



GOOD FIT/BAD FIT?

Ear Canal Caps:

- Noise Reduction Rating (NRR)=18dB
- NRR i e with this HPD

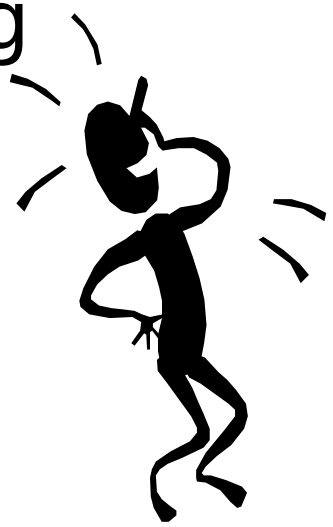


Fitting Technique:

- Canal caps should be inserted tightly into the opening of the ear canal
- Headband placement can be on top of the head, behind the head, or under the chin
- Users with a very large or very small head may receive poor benefit

Advantages Of Ear Canal Caps:

- Quickly inserted without soiling
- Medical fit not required
- Easily carried, light
- Best for intermittent noise of moderate intensity (95 dB or less)
- Universal fit (one size fits all)



Disadvantages Of Ear Canal Caps:

- More expensive than earplugs
- Uncomfortable during extended use
- Very limited attenuation
- Poor headband tension defeats value

Circumaural Noise Muffs

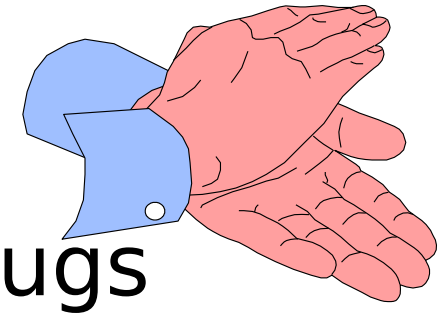
Noise Reduction Rating (NRR)=25dB

Fitting Technique: Circumaural Noise Muffs

- Noise muffs should seal firmly around the pinna (Replace ear cushions/seals when cracked or worn).
- The Type II ear muffs allow placement of the headband on top of the head, behind the head, or under the chin.
- Can be worn in combination with insert earplugs.
- Can be incorporated into hard hat or cranials (flight deck helmet with high performance ear muffs)

Advantages of Circumaural Noise Muffs

- Universal fit
- Good attenuation
- Can be worn with earplugs
  - Double protection = approx. 30dB of attenuation
- Can incorporate communications equipment and/or Active Noise Reduction (ANR) features
- Medical fit not required



Disadvantages Of Circumaural Noise Muffs:

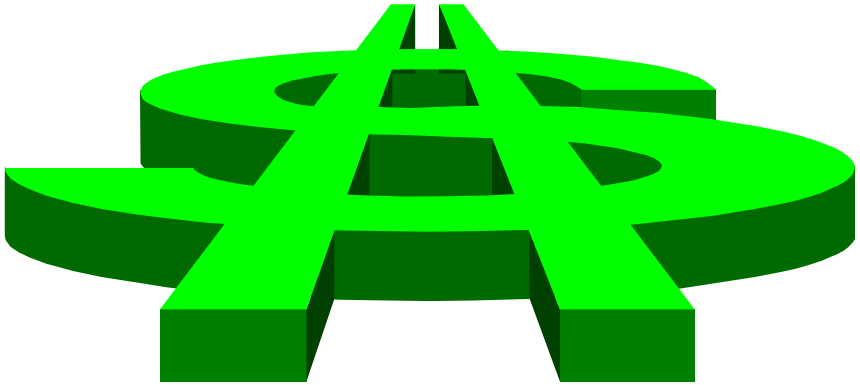
- Most expensive type of HPD
- Bulky and heavy
- Uncomfortable in heat
- Hair/eyeglasses/earrings may decrease effectiveness
- Not easily carried

Helmets: For Specific Operational Uses

- Aviators, Aviation Crew
- Flight deck personnel
- Tankers
- Amphibious Assault Vehicle Crew Members

Funding for Hearing Protection

- HPDs are purchased by the unit or shop supervisor of the noise-hazardous area/personnel.
- Pre-formed earplugs must be medically fit by trained personnel. Coordination needs to occur between the unit and the medical dept.



Hearing Protection Selection Considerations (cont.)

- Environmental Factors
  - Heat/humidity – earmuffs will be uncomfortable
  - Hat/helmet use – earplugs are a good choice
  - Communication needs – depends on environment & type of communciation (verbal/electronic)
  - Intermittent exposures – canal caps work well in moderate to low noise levels
  - Corrosives – earplugs are a bad choice

Hearing Protection Selection Considerations (cont.)

Select Approved Devices

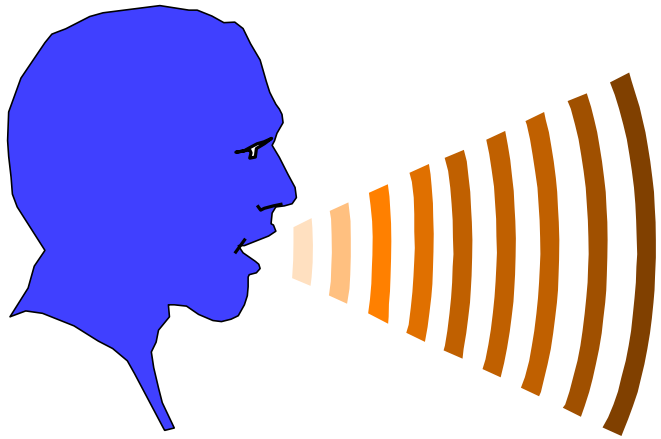
- Sound Guard - only medium foam plug authorized for military use. Small & large sized foam plugs also available.
- All noise muffs (without radios incorporated) are authorized.
- Any HPD that has been tested by a DoD or NEHC approved lab is acceptable.

Hearing Protection Selection Considerations (cont.)

Devices must:

- Meet attenuation needs
- Not overprotect
- Meet environmental/comfort needs
- Meet communication & safety needs
- Be cost-effective for your purposes

Hearing Protection and Hearing Performance



Lombard Effect – occurs when people raise their voices in the presence of loud background noise in order to be able to monitor their speech and allow others to hear them.

Hearing Protection and Hearing Performance (cont.)

Occlusion Effect – Plugging your ears does not affect your ability to hear your own voice, since you hear yourself via bone conduction.

Hearing Protection and Hearing Performance (cont.)

- Interaction of the Lombard and Occlusion Effects with the use of hearing protection allows people to assume a voice level that is appropriate to overcome the effects of noise and attenuation to permit good communication over a broad range of noise conditions.
- Normal hearing listeners typically communicate better with HPDs in high noise. This is not always the case with hearing impaired listeners, but the alternative is progressive, permanent hearing loss.

Other HPD Performance Factors

- Effective HPD performance requires practice using HPD’s consistently.
- Using HPD’s is always preferable to a progressive, permanent hearing loss.
- Caution not to overprotect.
- HPD’s may require periodic re-adjustment to maintain maximum effectiveness.

Care and Maintenance of Hearing Protection

Hand Formed Earplugs

- **Intended as single use items, to be disposed of in proper receptacle.**
- **Never use if metal filings or corrosives contacted.**

Care and Maintenance of Hearing Protection

- Hand-formed earplugs
  - Made for one-time use, must dispose of after each use.
- Pre-formed earplugs/Ear canal caps
  - Clean after each use with warm, soapy water; rinse & dry completely before re-use
  - Avoid insertion with soiled hands
  - Periodic check for correct size & condition
  - Get a new pair & carrying case, as needed

Care and Maintenance of Hearing Protection

- Noise muffs
  - Wipe down ear cups with moist, alcohol-free cloth after use
  - Replace seals when cracked or broken
  - Replace cushions as needed
  - Check for ear cup defects/deformities
  - Check headband tension
  - Modification of muffs (to incorporate music, etc.) is prohibited

Employee Considerations

- Personnel in the Hearing Conservation Program have the right to choose which type of hearing protection they prefer to wear from among approved selections.
- Hearing protection must be issued at no cost to the employee and replaced whenever lost, damaged or poorly fitted.
- The best hearing protection is the one that is most comfortable to the wearer (the one they will wear).
- Medical contra-indications and environmental considerations may limit employee choice.
- Custom-molded HPD’s may be used by prescription only.

Musician Hearing Protection

- HPD’s designed specifically for musicians and sound engineers
- Medically fit and custom made for each individual
- NRR = 15-25dB

Communication Earplugs (CEP)

- New HPD designed with communication capability incorporated for use with aircraft and flight deck operations.
- Some incorporate a foam earplug tip and some use a custom ear piece.

Active Noise Reduction (ANR)

- Electronically cancels certain incoming sounds
- Better at reducing low frequency noise
- Not effective with jet noise due to frequency characteristics
- ANR devices are not currently approved, but research is ongoing

QUESTIONS??